30-Day Launch Forecast

6 July 2000

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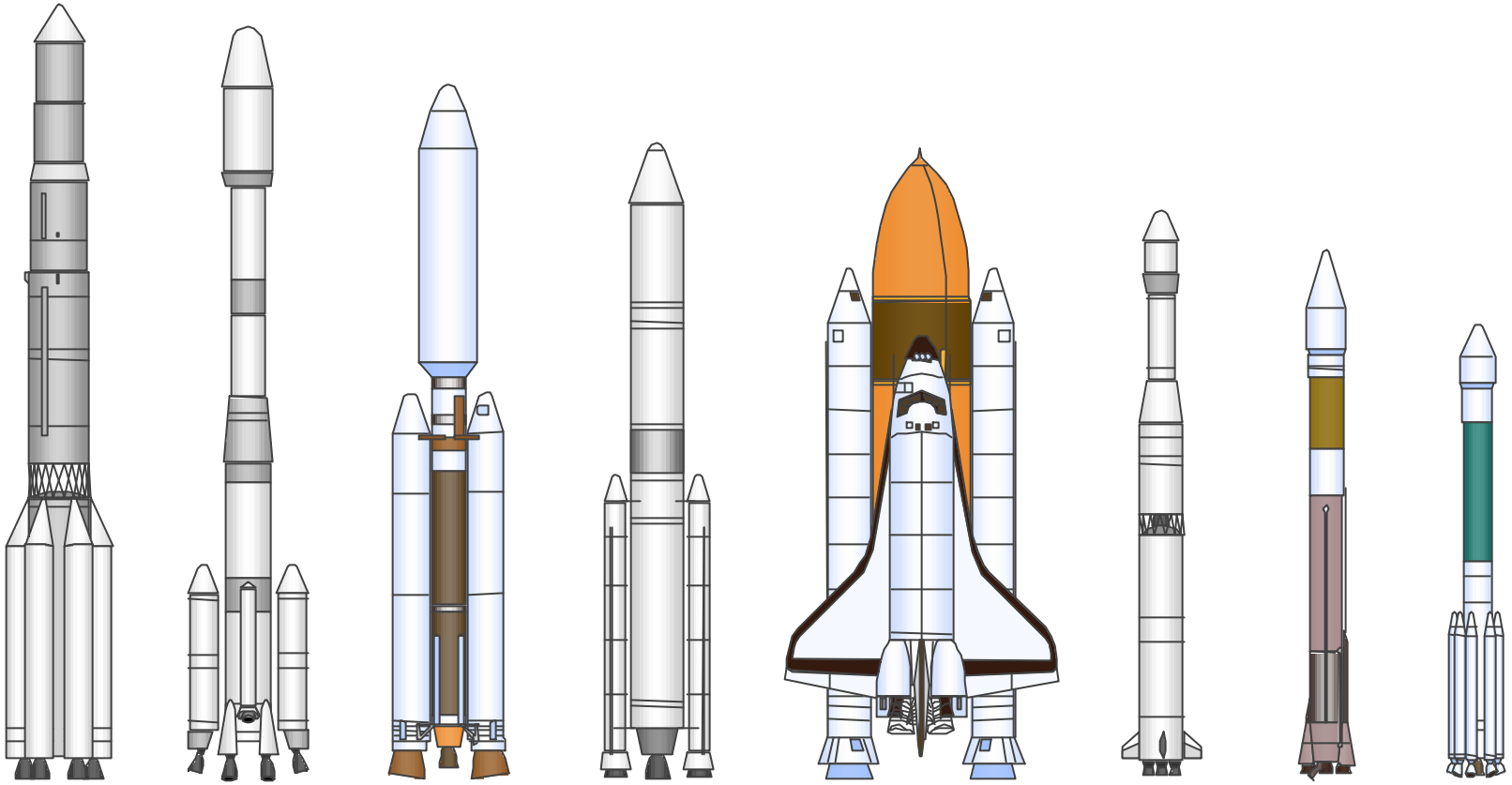
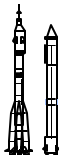
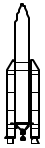
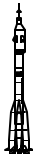


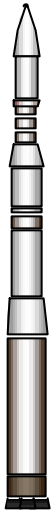
30-Day Launch Forecast
(06 July 2000 - 04 August 2000)

Mon	Tue	Wed	Thu	Fri	Sat	Sun	Comments / Schedule Changes
A Look Ahead 09 Aug Soyuz-Fregat Cluster-2 17 Aug Ariane 44LP Nilesat 102 23 Aug Delta 3 dummy 25 Aug Dnepr Saudisat 1-A & 1-B 29 Aug Titan 2 NOAA-L 08 Sep STS-106 ISS 2A.2B 21 Sep Soyuz-U Progress M1 All foreign launches presented in this forecast are unofficial			6	7 Minuteman II IFT-5 LF-03 VAFB 2201-0201 EDT	8	9	Minuteman II / Intercept Flight Test (IFT)-5 • Missile defense test Proton / Zvezda Service Module; ISS Flight 1R • Second Russian component of the International Space Station (ISS) Atlas 2AS / EchoStar-6 • 6th DBS satellite for the EchoStar Com. Corp. • System broadcasts for the Digital Sky Highway (DISH)
10	11	12  Proton Zvezda Baikonur 0056 EDT	13 Atlas 2AS EchoStar-6 SLC-36B CCAFS 0121-0320 EDT	14  Soyuz-Fregat Cluster-2 Baikonur 0840 EDT	15  Kosmos 3M CHAMP MITA Plesetsk TBD EDT	16  Delta 2 GPS IIR-5 SLC-17A CCAFS 0517-0543 EDT	Soyuz-Fregat / Cluster-2 • First two of four identically instrumented science satellites sponsored by ESA Kosmos 3M / CHAMP / MITA / BIRD • CHAMP: Challenging Mini-Satellite Payload for Geophysical Research and Application (German) • MITA: Mini-satellite Italiano a Tecnologia Avanzata (Italian) • BIRD: Bispectral Infrared Detection microsatellite (German)
17	18	19  Minotaur MightySat II.1 SLC-6 VAFB 1609-1735 EDT	20	21	22	23	Delta 2 (7925) / GPS IIR-5; Flight 279 • NAVSTAR Global Positioning System Minotaur / MightySat II.1 • Orbital/Suborbital Launch Vehicle • Air Force Research Laboratory (AFRL) multi-mission, small satellite program
24	25  Ariane 5 Astra-2B/ GE-7 ELA-3 CSG TBD EDT	26	27 Sea Launch PAS-9 Launch Platform 1846 EDT	28	29	30	Ariane 506 / Astra-2B / GE-7; Flight 130 • Astra-2B: SES of Luxemburg communications system • GE-7: GE Americom communications satellite Sea Launch / PAS-9 • PanAmSat DTH communications satellite Titan 4B / NRO; Mission B-28 • Classified military satellite • No Upper Stage (NUS/403 configuration)
31  Titan 4B NRO SLC-4E VAFB 2200-0200 EDT	1 Aug	2  Soyuz-U Progress M1 Baikonur 0840 EDT	3	4	**Last Week's Launch Activities** Launch Date provided in Universal Time		

Date	Vehicle	Payload	Site	Type
30 Jun	Atlas 2A	TDRS-H	CCAFS, SLC-36A	Communications
30 Jun	Proton	Sirius-1	Baikonur	Communications
04 Jul	Proton	Geyser	Baikonur	Data Relay

Acronyms: VAFB - Vandenberg AFB CA; SLC - Space Launch Complex; CCAFS - Cape Canaveral AFS FL; LC- Launch Complex; KSC - Kennedy Space Center FL; LF - Launch Facility; EAFB - Edwards AFB CA; EDT - Eastern Daylight Time; NET - No Earlier Than; EST - Eastern Standard Time; WFF - Wallops Flight Facility; CSG - Guiana Space Center

Minuteman II



Current Mission Specifics

5th launch of the Minuteman II IFT Program

Reliability History (IFT Program only)

- **4 successes in 4 attempts**

Typical Launch Sequence

- **N/A**

Payload Weight: N/A

Orbit: N/A

Next Minuteman II launch

- **6 September 2000 / IFT-6**

Background Information

First Launch:	**1961**
Flight Rate:	**TBD**
Launch Site:	**VAFB, USA and CCAF, USA**
Capability:	**300 LB to Polar Orbit**

History

- **Minuteman ICBM began launching in early 1960's.**
- **450 ICBM missiles are being retired with a 20 year 98% success rate.**
- **Use of these boosters is consistent with Strategic Arms Reduction Treaty (START) and Missile Technology Control Regime (MTCR) guidelines.**
- **Rocket System Launch Program (RSLP) received it's SECDEF charter in 1972.**
- **Minuteman will be operational beyond 2010.**

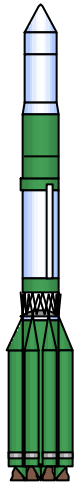
Description

- **Three-stage Minuteman ICBM launched above ground.**
- **Contains a Velocity Control System to circularize orbit and provide final attitude control.**
- **Stage 1 Thiokol solid rocket motor generating 178,200 lb of thrust.**
- **Stage 2 Aerojet Solid rocket motor generating 60,300 lb of thrust.**
- **Stage 3 United Technologies solid rocket motor generates 34,200 lb thrust.**

Profile

Length:	**72 ft**	**Launch Weight:**	**75,400 lb**
Diameter:	**5.5 ft**	**Liftoff Thrust:**	**178,200 lb**
Payload Fairing:	**12.5 x 3.3 ft**		

Proton



Current Mission Specifics

197th launch of the Proton since 1980

Reliability History (Since 1980)

- **184 successes in 196 attempts**

Typical Launch Sequence

Stage 1 Ignition (10% thrust)	**-10.0 sec**
Stage 1 thrust 100%	**0.0 sec**
Liftoff	**0.57 sec**
Stage 2 ignition	**116.91 sec**
Stage 1/2 separation	**121.11 sec**
Stage 3 vernier ignition	**330.0 sec**
Stage 2 shutdown	**332.7 sec**
Stage 2/3 separation	**333.4 sec**
Stage 3 main ignition	**335.8 sec**
PLF jettison	**351.0 sec**
Stage 3 main engine S/D	**567.11 sec**
Stage 3/4 separation	**582.01 sec**
Block 4 orbit insertion events	**TBD**

Payload weight: Zvezda; 42,000 lb (at launch)

Orbit: 210 nm circular, 51.6° inclination

Next Proton launch:

- **August 2000 / Ekran-M**

Background Information

First Launch:	**July 1965**
Flight Rate:	**13 per year (maximum recorded launch rate)**
Launch Site:	**Baikonur, Kazakhstan**
Capability:	**44,100 lb to LEO; 10,580 lb to GTO; 5,730 lb to GEO**

History

- **Originally intended as a ballistic missile but converted to a space launch vehicle during development.**
- **Two, three, and four-stage versions were developed.**
- **Integrated by the Khrunichev state space center.**
- **Used to launch satellites into GEO, interplanetary spacecraft, and manned space stations such as Salyut and Mir.**

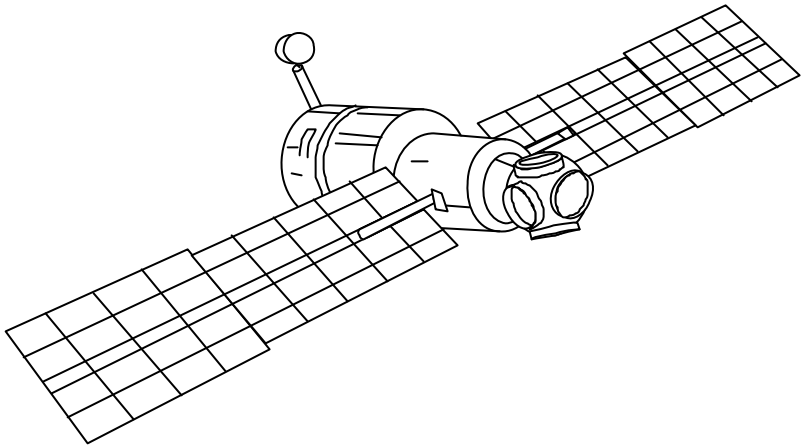
Description

- **Three (SL-13) or four-stage (SL-12) liquid-fueled vehicle.**
- **Stage 1 has six strap-on boosters with RD-253 engines burning N_2O_4 fed from the core stage 1 tank with UDMH fuel carried in the strap-on tanks, generating a total of 1,980,000 lb of thrust.**
- **Stage 2 has four RD-0210 sustainer engines burning N_2O_4/UDMH fed from stage 2 tank, generating a total of 534,600 lb of thrust.**
- **Stage 3 has one RD-0210 engine with four verniers burning N_2O_4/UDMH, generating a total thrust of 140,650 lb.**
- **Stage 4 Block DM has one restartable RD-58 burning LOX/kerosene, generating a total thrust of 19,125 lb.**
- **Proton M uses Breeze M Stage 4 with single fixed restartable DB Khimmash engine burning N_2O_4/UDMH, generating 4,415 lb of thrust.**

Profile

Length:	**189.5 ft**	**Launch Weight:**	**1,521,175 lb**
Diameter:	**24.3 ft**	**Liftoff Thrust:**	**1,980,000 lb**
Payload Fairing:	**32.8 ft x 14.3 ft**		

Zvezda Service Module (ISS)



Spacecraft Specifications

Payload Weight:

- **42,000 lb (at launch)**

Dimensions:

- **Length: 43 ft**
- **Solar Arrays: 97.5 ft**

Zvezda (“Star”)

The Zvezda Service Module will be the first fully Russian contribution to the International Space Station and will serve as the early cornerstone for the first human habitation of the station. It will function as the primary docking port for Progress-type cargo resupply vehicles, and provide propulsive attitude control and reboost capability for the early station.

Mission

The mission of the International Space Station is to create a permanent orbiting science institute in space capable of performing long-duration research in the materials and life sciences areas in a nearly gravity-free environment, and to enable the long-term exploration of space for the benefit of people on Earth.

Description

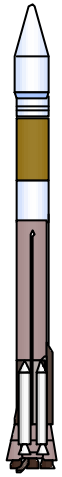
Spacecraft Description:

- **Four docking ports for Progress and Soyuz resupply ships.**
- **Three pressurized compartments: a small, spherical Transfer Compartment at the forward end; the long, cylindrical main Work Compartment; and the small, cylindrical Transfer Chamber at the aft end.**
- **Unpressurized Assembly Compartment is wrapped around the exterior of the Transfer Chamber at the aft of the module; holds external equipment such as propellant tanks, thrusters and communications antennas.**
- **Design life: 15 years.**

Orbit: 210 nm circular, 51.6° inclination

Prime Contractor: Khrunichev State Research and Production Center

Atlas 2AS



Current Mission Specifics

302nd space launch of the Atlas vehicle

Reliability History

- **Atlas: 276 successes in 301 attempts**
- **Atlas 2 / 2A / 2AS: 48 successes in 48 attempts**

Typical Launch Sequence

• Ground-Lit SRB Ignition	-0.5	sec
• Booster Sustainer Ignition	0	sec
• Booster Engine Cutoff	163	sec
• Booster Package Jettison	166	sec
• Payload Fairing Jettison	215	sec
• Sustainer Engine Cutoff	289	sec
• Atlas/Centaur Separation	293	sec
• Centaur Main Engine Start (#1)	310	sec
• Centaur Main Engine Cutoff (#1)	585	sec
• Centaur Main Engine Start (#2)	1,476	sec
• Centaur Main Engine Cutoff (#2)	1,572	sec
• Spacecraft Separation	1,799	sec

Payload weight: EchoStar-6; 7,941 lb (at launch)

Orbit: Geostationary, 110° West

Next Atlas 2 series (2A or 2AS) launch

- **TBD / Atlas 2AS / ICO-A2**

Background Information

First Launch:	**December 1993**
Flight Rate:	**4-6 per year**
Launch Site:	**SLC-36A & SLC-36B (CCAFS, USA); SLC-3E (VAFB, USA)**
Capability:	**18,980 lb to LEO (medium fairing); 8,450 lb to GTO**

History

- **Started in 1950s as Air Force ICBM.**
- **Modified in 1960s for space launches.**
- **Cryogenic Centaur upper stage first launched in 1962.**
- **Atlas 2AS is an uprated version of the Atlas 2A.**
- **Four solid rocket motors added to form Atlas 2AS.**

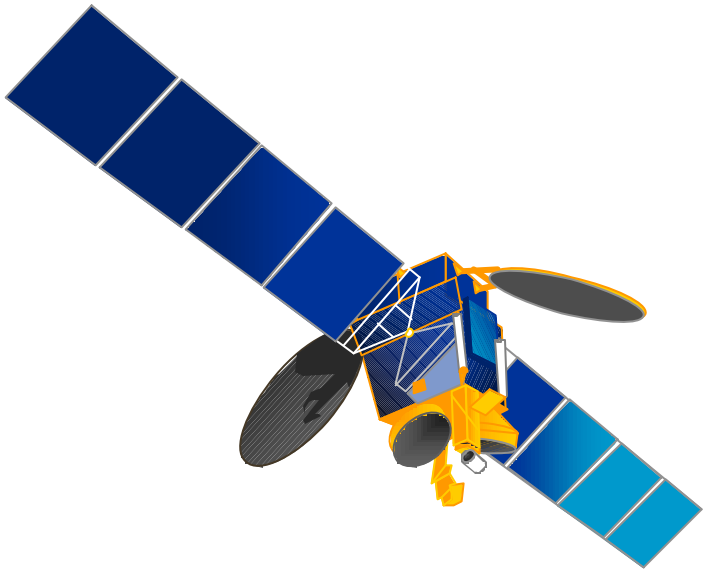
Description

- **Three and a half stage vehicle.**
- **Stage 1 consists of two Rocketdyne MA-5A booster engines plus one sustainer engine burning LOX/RP-1 fed from stage 1 tanks, generating a total of 485,775 lb of thrust.**
- **Stage 2 (Centaur) uses two Pratt & Whitney RL10A-4-1 engines (with an optional extendible nozzle) that burn LH_2/LOX, generating 44,600 lb of thrust with Block I upgrade.**
- **Four Thiokol Castor IVA solid rocket motors burn HTPB, generating 97,560 lb of thrust each.**

Profile

Length:	**156 ft**	**Launch Weight:**	**523,585 lb**
Diameter:	**10 ft**	**Liftoff Thrust:**	**680,895 lb**
Payload Fairing:	**34 x 11 ft (Medium); 40 x 13.8 ft (Long); 43 x 13.8 ft (Extended)**		

EchoStar-6



Spacecraft Specifications

Weight:

- **7,941 lb (at launch)**

Dimensions:

- **Solar Arrays: 102.7 ft**

EchoStar-6

Sixth in a series of DBS communications satellites owned by EchoStar Communications Corporation.

Mission

Provide video, audio and data services throughout the continental United States, Hawaii and Alaska via the Digital Sky Highway (DISH) Network.

Description

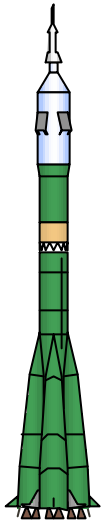
Spacecraft Description:

- **FS-1300 series bus; three-axis stabilized.**
- **32 active 125 W TWTAs Ku-band beams; reconfigurable into 16 active 220 W transponders.**
- **Power: 10 kW (BOL); NiH_2 batteries for eclipse protection.**
- **Design life: 12 years.**

Orbit: Geostationary, 110° West (co-located with EchoStar-5)

Prime Contractor: Space Systems/Loral

Soyuz-Fregat



Background Information

First Launch:	**November 1963**
Flight Rate:	**45 per year (maximum recorded launch rate)**
Launch Site:	**Plesetsk, Russia; Baikonur, Kazakhstan**
Capability:	**15,400 lb to LEO; 5,500 lb to 760 nm circular, 51.8° orbit (with Ikar)**

History

- **Developed from the Vostok Launch Vehicle originally derived from the SS-6 (Sapwood) ICBM.**
- **Used to launch every former Soviet Union piloted spacecraft since 1964.**
- **Also used to launch photo reconnaissance satellites, earth resource satellites, and Progress resupply missions to the Mir space station.**
- **Starsem, a joint European/Russian venture, formed in 1996 to market Soyuz-Fregat, a commercial version of Soyuz.**

Current Mission Specifics

550th launch of a Soyuz Launch Vehicle since 1980

Reliability History (since 1980)

- **536 successes in 549 attempts**

Typical Launch Sequence

• **Lift off**	**0 sec**
• **Strap-ons separate**	**118 sec**
• **Payload fairing jettison**	**160 sec**
• **Core stage 1 separation**	**286 sec**
• **Orbit Injection**	**540 sec**

Payload Weight: Cluster-2; 5,290 lb (total at launch)

Orbit: Highly eccentric polar orbits ranging from 13,510 to 67,555 nm at 64.8° - 90° inclination

Next Soyuz launch

- **21 September 2000 / Progress M1 (ISS)**

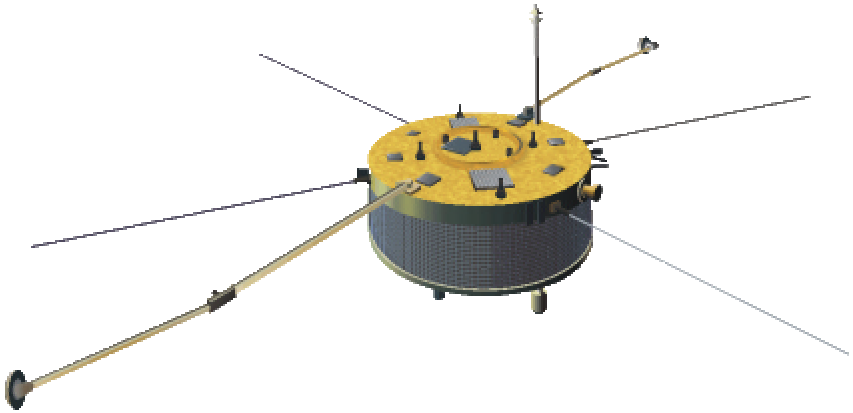
Description

- **Two-stage (plus 4 strap-ons) liquid fueled vehicle.**
- **Stage 1 core has one RD-108 booster engine (one turbopump with four separate combustion chambers) burning LOX/kerosene fed from stage 1 tanks, generating 220,050 lb of thrust.**
- **Four Stage 1 strap-ons each have one RD-107 engine (one turbopump with four separate combustion chambers) burning LOX/kerosene fed from stage 1 tank, generating a total of 227,925 lb of thrust each.**
- **Stage 2 has one RD-0110 Block 1 engine burning LOX/kerosene, generating 67,050 lb of thrust.**
- **Starsem version only: Fregat restartable upper stage powered by a single-chamber Lavochkin engine engine burning UDMH/N_2O_4, generating 4,410 lb of vacuum thrust.**

Profile

Length:	**162.5 ft**	**Launch Weight:**	**682,765 lb**
Diameter:	**33.8 ft**	**Liftoff Thrust:**	**1,334,700 lb**
Payload Fairing:	**37.3 ft x 9.8 ft**		

Cluster II



Cluster II

First pair of four identical satellites that will fly in formation. Cluster II is one of ESA's top priority Cornerstone science missions, and replaces the original Cluster mission that was destroyed during the failed maiden launch of the Ariane 5 rocket in June 1996.

Mission

Study the interaction between the the solar wind and the Earth's magnetosphere allowing for the first time truly three-dimensional measurements of both large- and small-scale phenomena in the near-Earth environment.

Description

Spacecraft Description:

- **Spin-stabilized cylindrical bus; orbit/attitude maintenance performed by semi-radial and axial control thrusters together with the main engine.**
- **Each satellite carries an identical set of 11 instruments mounted to the Main Equipment Platform.**
- **Power: 224 W provided by six curved solar-array panels; five 80 Ah Silver Cadmium batteries provide eclipse protection.**
- **Carries two 5 meter-long experiment booms, four 50 meter-long wire booms, and two antenna booms.**
- **Telemetry downlink bit rate 2 to 262 kbit/s.**
- **Design life: 2 years.**

Orbit: **Highly eccentric polar orbits ranging from 13,510 to 67,555 nm at 64.8° - 90° inclination**

Prime Contractor: Dornier

Spacecraft Specifications

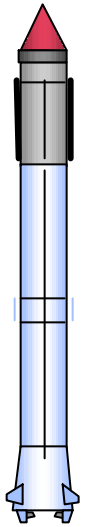
Weight:

- **2,645 lb (at launch)**
- **1,213 lb (dry mass)**

Dimensions:

- **Height:** **4.3 ft**
- **Diameter:** **9.5 ft**

Kosmos 3M



Current Mission Specifics

431st space launch of the Kosmos vehicle

Reliability History

- **412 successes in 430 attempts**

Typical Launch Sequence

- **N/A**

Payload Weight: CHAMP; 1,102 lb (at launch)
MITA; N/A
BIRD; 171 lb (at launch)

Orbit: 254 nm circular, near-polar orbit, 83° inclination

Next Kosmos launch

- **TBD**

Background Information

First Launch:	**August 1964**
Flight Rate:	**28 per year (maximum recorded launch rate)**
Launch Site:	**Plesetsk and Kapustin Yar, Russia**
Capability:	**3,085 lb to LEO**

History

- **Originated in 1950s as the SS-5 (Skean) ballistic missile.**
- **Developed into a launch vehicle by NPO Yuzhnoye (Ukraine).**
- **First used in 1964 for multiple launch of small satellites.**
- **Production transferred to AKO Polyot in Omsk, Russia.**

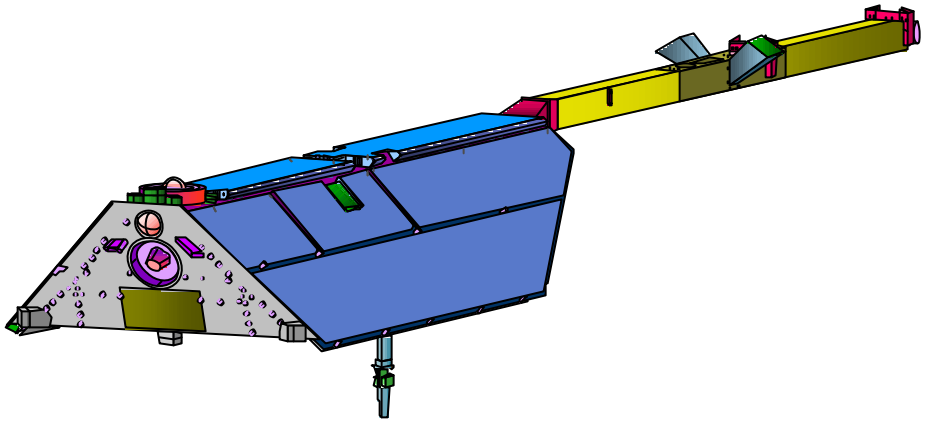
Description

- **Two-stage liquid-fueled vehicle.**
- **Stage 1 uses one RD-216 booster engine burning N_2O_4/UDMH propellant generating a total of 388,350 lb of thrust.**
- **Stage 2 KB Khimmach 11D49 engine burns N_2O_4/UDMH and produces 35,393 lb of thrust from main chamber. Four steering thrusters provide 405 lb of thrust each.**
- **Stage 2 has restart capability for orbit circularization.**

Profile

Length:	**106.3 ft**	**Launch Weight:**	**240,300 lb**
Diameter:	**7.9 ft**	**Liftoff Thrust:**	**388,350 lb**
Payload Fairing:	**18.8 ft x 7.8 ft**		

CHAMP



Spacecraft Specifications

Weight:

- **1,102 lb (at launch)**

Dimensions:

- **Length:** **14.3 ft**
- **Height:** **5.4 ft**
- **Base:** **3.3 ft**
- **Top:** **.98 ft**
- **Boom Length:** **13.1 ft**

CHAMP

The German CHAMP (Challenging Mini-Satellite Payload for Geophysical Research and Application) satellite geomagnetic mission will investigate the Earth gravity field, the global Earth magnetic field, as well as the Earth's atmosphere / ionosphere. The mission leader and customer of the satellite is the GFZ GeoForschungsZentrum Potsdam.

Mission

The purpose of the project is to develop an attitude control system for fine pointing with minimal consumption of the cold gas, which is vital for extension of the mission life-time.

Description

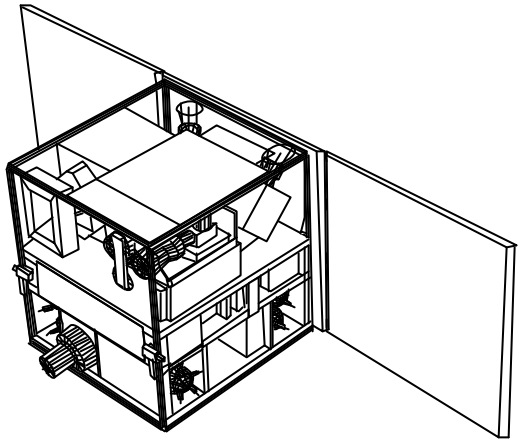
Spacecraft Description:

- **3 axis stabilized, trapezoid-shaped body, aligned to Earth.**
- **Equipped with three electromagnetic coils and cold gas-jets to provide control torque.**
- **Payload instruments: ONERA Accelerometer, Fluxgate and Overhauser Magnetometers, Star Sensors, Digital Ion Drift Meter, Laser Retro Reflector, GPS.**
- **Power: 6 m² of body-mounted solar generator surface produces 140 W; battery of NiH_2-cells ensures the appropriate power supply during eclipses.**
- **Design life: Multi-year mission.**

Orbit: 254 nm circular, near-polar orbit, 83° inclination

Prime Contractor: Jena-Optronik

BIRD



Spacecraft Specifications

Weight:

- **171.4 lb (at launch)**

Dimensions:

- **Main Body: 1.8 x 1.9 x 2.0 ft**

Bispectral InfraRed Detection (BIRD)

The BIRD mission is a small satellite program within the DLR for the development of a new generation of imaging infrared sensors for Earth remote sensing objectives, which can be used for planetary exploration.

Mission

Demonstrate the scientific and technological value and the technical and programmatic feasibility of the combination of ambitious science and new, not yet space-proofed advanced technologies with a small satellite mission conception under low-budget constraints.

Description

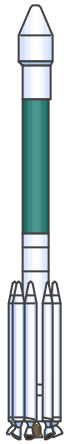
Spacecraft Description:

- **Modular honeycomb bus assembly with three independent segments forming a compact cube.**
- **Data downlink 2.2 Mbps via S-Band transmitter; uplink rate for command 19.2 kbps.**
- **Solar array consists of 3 solar panels (2 deployable, 1 body-mounted) with a available power of 120 W (EOL); NiH_2 battery consists of 8 cells and has a capacity of 240 Wh.**
- **Design life: 1 year.**

Orbit: 243-486 nm (preferably 243-270 nm), 53° inclination

Prime Contractor: DLR (Germany)

Delta 2



Current Mission Specifics

279th launch of the Delta vehicle

Reliability History

- **Delta: 262 successes in 278 attempts**
- **Delta 2: 88 successes in 89 attempts**

Typical Launch Sequence

• Stages 0 & 1 Ignition, Liftoff	0	sec
• Solid Boosters Jettison	63	sec
• Solid Ignition (3 Solids)	66	sec
• Solid Boosters Jettison	133	sec
• Second Stage Ignition	278	sec
• Fairing Jettison	302	sec
• Third Stage Ignition	1,400	sec
• Spacecraft Separation	1,700	sec

Payload Weight: GPS IIR-5; 4,480 lb (at launch)

Orbit: 10,898 nm circular, 55° inclination

Next Delta 2 launch

- **17 October 2000 / Earth Observing-1**

Background Information

First Launch:	**February 1989**
Flight Rate:	**6-12 per year**
Launch Site:	**SLC-17A & SLC-17B (CCAFS), SLC-2 (VAFB)**
Capability:	**11,110 lb to LEO (28.5°); 4,120 lb to GTO**

History

- **Delta program initiated by NASA in 1959.**
- **Incorporated components from USAF's Thor and USN's Vanguard.**
- **First Delta vehicle launched in May 1960.**
- **Delta 2 is enhanced version of Delta 3920/PAM.**

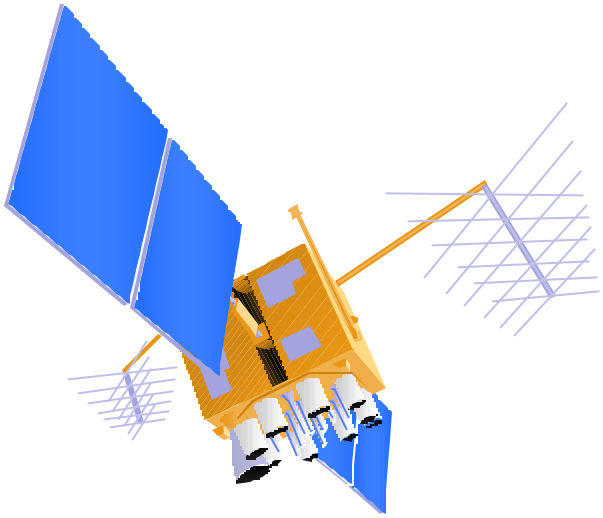
Description

- **Three-stage vehicle plus up to nine strap-on motors.**
- **Stage 0 consists of nine Alliant Techsystems Graphite Epoxy Motors (GEMs) providing 98,870 lb of thrust each (three are air lit).**
- **Stage 1 uses one Rocketdyne RS-27A engine that burns LOX/RP-1, generating 201,000 lb of thrust.**
- **Stage 2 uses one Aerojet ITIP engine that burns N_2O_4/A-50, generating 9,645 lb of thrust.**
- **Stage 3 (model 7925 only) uses one Thiokol Star 48B solid rocket motor that burns HTPB, generating 15,100 lb of thrust. Model 7920 has no 3rd stage.**

Profile

Length:	**126.0 ft**	**Launch Weight:**	**511,180 lb**
Diameter:	**8.0 ft**	**Liftoff Thrust:**	**699,750 lb**
Payload Fairings:	**27.8 ft x 9.5 ft; 29.2 ft x 10.0 ft**		

GPS IIR-5



Spacecraft Specifications

Weight:

- **4,480 lb (at launch)**
- **2,370 lb (BOL)**

Dimensions: (deployed)

- **Main Body: 5.0 x 6.33 x 6.25 ft**
- **Solar Arrays: 144 ft^2**

GPS IIR-5

5th of the Block IIR series Global Positioning Satellites. The GPS IIR program includes 21 satellites that will improve navigation accuracy and provide longer autonomous satellite operation than current GPS satellites.

Mission

Provide highly accurate, worldwide navigational position and velocity for DoD and civilian users.

Description

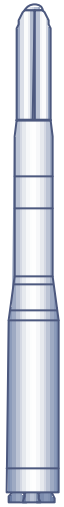
Spacecraft Description:

- **Six aluminum honeycomb panels mounted to central aluminum core.**
- **Zero momentum, 3-axis stabilized, Earth-oriented, Sun-nadir pointing.**
- **L-band subsystem: 20- to 50-Watt transmitter; 20 MHz bandwidth; 1575.42 MHz (L1), 1227.6 MHz (L2).**
- **Power: 1,136 W (EOL) provided by twin 2-panel Si solar wings; NiH_2 battery for eclipse protection.**
- **Design life: 10 years min.**

Orbit: 10,898 nm circular, 55° inclination

Prime Contractor: Lockheed Martin Missiles & Space

Orbital/Suborbital (Minotaur)



Current Mission Specifics

2nd launch launch of the Minotaur Vehicle

Reliability History

- **1 success in 1 attempt**

Typical Launch Sequence

• Stage 1 ignition, Liftoff	0 sec
• Stage 1 separation, stage 2 ignition	61 sec
• Fairing separation	118 sec
• Stage 2 separation	128 sec
• Stage 3 ignition	127 sec
• Stage 3 burnout	199 sec
• Stage 3 separation	604 sec
• Stage 4 ignition	615 sec
• Stage 4 burnout	684 sec
• Payload separation	744 sec

Payload Weight: MightySat II.1; 275 lb (at launch)

Orbit: 150 to 400 nautical miles, all inclinations

Next Minotaur Launch

- **TBD**

Background Information

First Launch:	**January 2000**
Flight Rate:	**1-2 per year**
Launch Sites:	**VAFB, USA and possibly Kodiak, Alaska**
Capability:	**780 lb to 400 x 400 sun-synchronous (1,482 lb to 100 nm, 28.5°)**

History

- **Orbital Sciences Corporation selected by Air Force Space and Missile Systems Center in September 1997 to convert Minuteman II.**
- **Contract with Orbital Sciences Corporation worth $206 million for up to 24 suborbital and orbital missions per year.**
- **U.S. government sponsored payloads only.**
- **Program Office, SMC-TEB Kirtland AFB.**

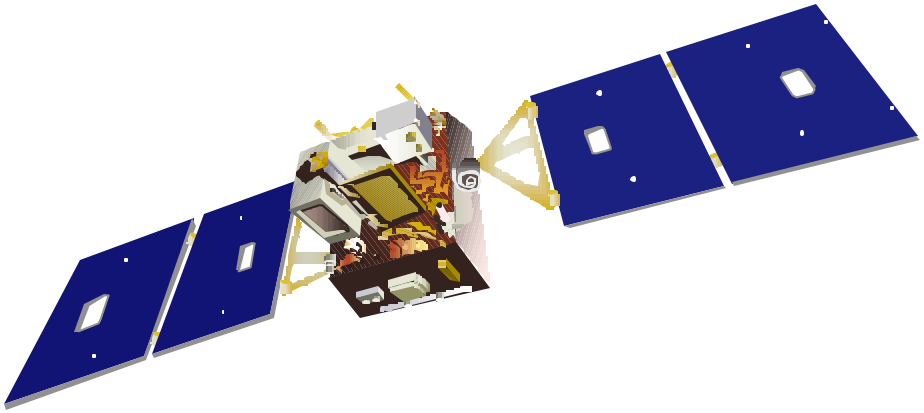
Description

- **Four-stage solid-propellant launch vehicle.**
- **Uses Minuteman II first and second stages and Pegasus upper stages.**
- **Stage 1 M-55 solid rocket motor generates 178,000 lb of thrust.**
- **Stage 2 SR-19 solid rocket motor generates 60,312 lb of thrust.**
- **Stage 3 Orion 50XL solid rocket motor generates 34,515 lb of thrust.**
- **Stage 4 Orion 38 solid rocket motor generates 7,435 lb of thrust**

Profile

Length:	**63 ft**	**Launch Weight:**	**79,800 lb**
Diameter:	**5.5 ft**	**Liftoff Thrust:**	**178,000 lb**
Payload Fairing:	**50 inch (Standard); 61 inch (Optional)**		

MightySat II.1



MightySat II.1 (also called Sindri)

MightySat II is an Air Force Research Laboratory (AFRL) multi-mission, small satellite program that demonstrates on-orbit high-payoff space system technologies. The MightySat II series of two to five spacecraft will provide AFRL with a "lab bench" for responsively testing emerging technologies to ensure their readiness for operational Air Force missions.

Mission

Provide the AFRL a tailorable, affordable method to rapidly demonstrate its emerging space technologies.

Description

Spacecraft Description:

- **3-axis stabilized Multi-functional Composite Bus Structure.**
- **Command & Data Handling: 380 Mbyte Solid State Storage; 20 Mbps Storage Rate.**
- **Communications via the Air Force Satellite Control Network (AFSCN); Uplink rate of 2 Kbps; Downlink rate of 1 Mbps.**
- **Payloads: Shape Memory Alloy Thermal Tailoring Experiment (SMATTE); Fourier Transform Hyperspectral Imager (FTHSI); Solar Array Flexible Interconnect (SAFI); Solar Array Concentrator (SAC), Naval Research Laboratory miniature Space Ground Link System Transponder (NSX); Quad C40 Experimental Processor (QC40).**
- **Power: 330 W (EOL) Si solar arrays; 28 V unregulated bus.**
- **Design life: 1 year.**

Orbit: 150 to 400 nautical miles, all inclinations

Prime Contractor: Spectrum Astro, Inc.

Spacecraft Specifications

Weight:

- **275 lb (at launch)**

Dimensions:

- **Main Body: 24 x 24 x 18 inches (stowed)**

Space Launch Activities
2000 Year To Date

United States Launches

Date	Vehicle	Payload	Site	Type
18 Jan	Minuteman II	IFT-4	VAFB, LF-03	Missile Defense (MIL)
21 Jan	Atlas 2A	DSCS-B8	CCAFS, SLC-36A	Communications (MIL)
27 Jan	Minotaur	JAWSAT	VAFB, SLC-7	Technology Demo (MIL)
03 Feb	Atlas 2AS	Hispasat 1-C	CCAFS, SLC-36B	Communications (COM)
08 Feb	Delta 2	Globalstar-14	CCAFS, SLC-17B	Communications (COM)
11 Feb	STS-99	SRTM	KSC, LC-39A	Radar Mapping (CIV)
08 Mar	Peacekeeper	GT-29-PA	VAFB, LF-05	FOT&E (MIL)
12 Mar	Taurus	MTI	VAFB, 576-E	Technology Demo (MIL)
12 Mar*	Sea Launch	ICO F-1	Pacific Ocean	Communications (COM)
25 Mar	Delta 2	IMAGE	VAFB, SLC-2W	Science (CIV)
03 May	Atlas 2A	GOES-L	CCAFS, SLC-36A	Meteorology (CIV)
08 May	Titan 4B	DSP-20	CCAFS, SLC-40	Early Warning (MIL)
11 May	Delta 2	GPS IIR-4	CCAFS, SLC-17A	Navigation (MIL)
19 May	STS-101	ISS 2A.2a	KSC, LC-39A	ISS Resupply (CIV)
24 May	Minuteman III	FTM-02	VAFB, LF-09	Flight Test Missile (MIL)
24 May	Atlas 3A	Eutelsat-W4	CCAFS, SLC-36B	Communications (COM)
07 Jun	Pegasus XL	TSX-5	VAFB	Science (MIL)
09 Jun	Minuteman III	GT-172-GM	VAFB, LF-10	FOT&E (MIL)
30 Jun	Atlas 2A	TDRS-H	CCAFS, SLC-36A	Communications (CIV)

French Launches

Date	Vehicle	Payload	Site	Type
25 Jan	Ariane 42L	Galaxy-10R	CSG, ELA-2	Communications (COM)
18 Feb	Ariane 44LP	SUPERBIRD-4	CSG, ELA-2	Communications (COM)
21 Mar	Ariane 505	INSAT-3B/ AsiaStar	CSG, ELA-3	Communications (COM) Communications (COM)
19 Apr	Ariane 42L	Galaxy 4-R	CSG, ELA-2	Communications (COM)

Chinese Launches

Date	Vehicle	Payload	Site	Type
25 Jan	LM 3A	Zhongxing-22	Xichang	Communications (CIV)
25 Jun	LM 3	Fengyun-2B	Xichang	Meteorological (CIV)

Indian Launches

Date	Vehicle	Payload	Site	Type
No Launches to Date				

Japanese Launches

Date	Vehicle	Payload	Site	Type
10 Feb*	M-5	ASTRO-E	Kagoshima	Science (CIV)

Brazilian Launches

Date	Vehicle	Payload	Site	Type
No Launches to Date				

* Indicates Launch Failure
Launch Date provided in Universal Time

Space Launch Activities
2000 Year To Date

Russian Launches

Date	Vehicle	Payload	Site	Type
01 Feb	Soyuz-U	Progress M1-1	Baikonur	Mir Resupply (CIV)
03 Feb	Zenit 2	Cosmos 2369	Baikonur	Signal Intelligence (MIL)
08 Feb	Soyuz-Fregat	IRDT	Baikonur	Technology Demo (COM)
12 Feb	Proton	Garuda-1	Baikonur	Communications (COM)
12 Mar	Proton	Express-6A	Baikonur	Communications (CIV)
20 Mar	Soyuz-Fregat	Dumsat	Baikonur	Technology Demo (COM)
04 Apr	Soyuz-U	Soyuz TM-30	Baikonur	Mir Resupply (CIV)
17 Apr	Proton	SESat	Baikonur	Communications (COM)
25 Apr	Soyuz-U	Progress M1-2	Baikonur	Mir Resupply (CIV)
03 May	Soyuz-U	Cosmos 2370	Baikonur	Classified (MIL)
16 May	Eurockot	SIMSAT-1 & -2	Plesetsk	Demo Flight (COM)
06 Jun	Proton	Gorizont-45	Baikonur	Communications (CIV)
24 Jun	Proton	Express-3A	Baikonur	Communications (CIV)
28 Jun	Kosmos 3M	Nadezhda/	Plesetsk	Navigation (CIV)
		Tsinghua-1/		Remote Sensing (CIV)
		SNAP-1		Technology Demo (CIV)
30 Jun	Proton	Sirius-1	Baikonur	Communications (COM)
04 Jul	Proton	Geyser	Baikonur	Data Relay (MIL)

Launch Market Analysis

By Country

	# of Launches	Percent of Market
US	10	31.3%
Russia	15	46.9%
France	4	12.5%
China	2	6.3%
Japan	1	3.1%

By Mission

	# of Launches	Percent of Market
US Military	3	9.4%
US Civil	3	9.4%
US Commercial	4	12.5%
World Military	3	9.4%
World Civil	9	28.1%
World Commercial	10	31.3%

By Orbit Type (Commercial Only)

GEO	# of Launches	Percent of Market
US	2	25.0%
Russia	2	25.0%
France	4	50.0%
China	0	0.0%
Japan	0	0.0%

LEO	# of Launches	Percent of Market
US	2	33.3%
Russia	4	66.7%
France	0	0.0%
China	0	0.0%
Japan	0	0.0%

Figures Do Not Include US Space Shuttle, Small Launch Vehicles, or ICBM launches

* Indicates Launch Failure
Launch Date provided in Universal Time